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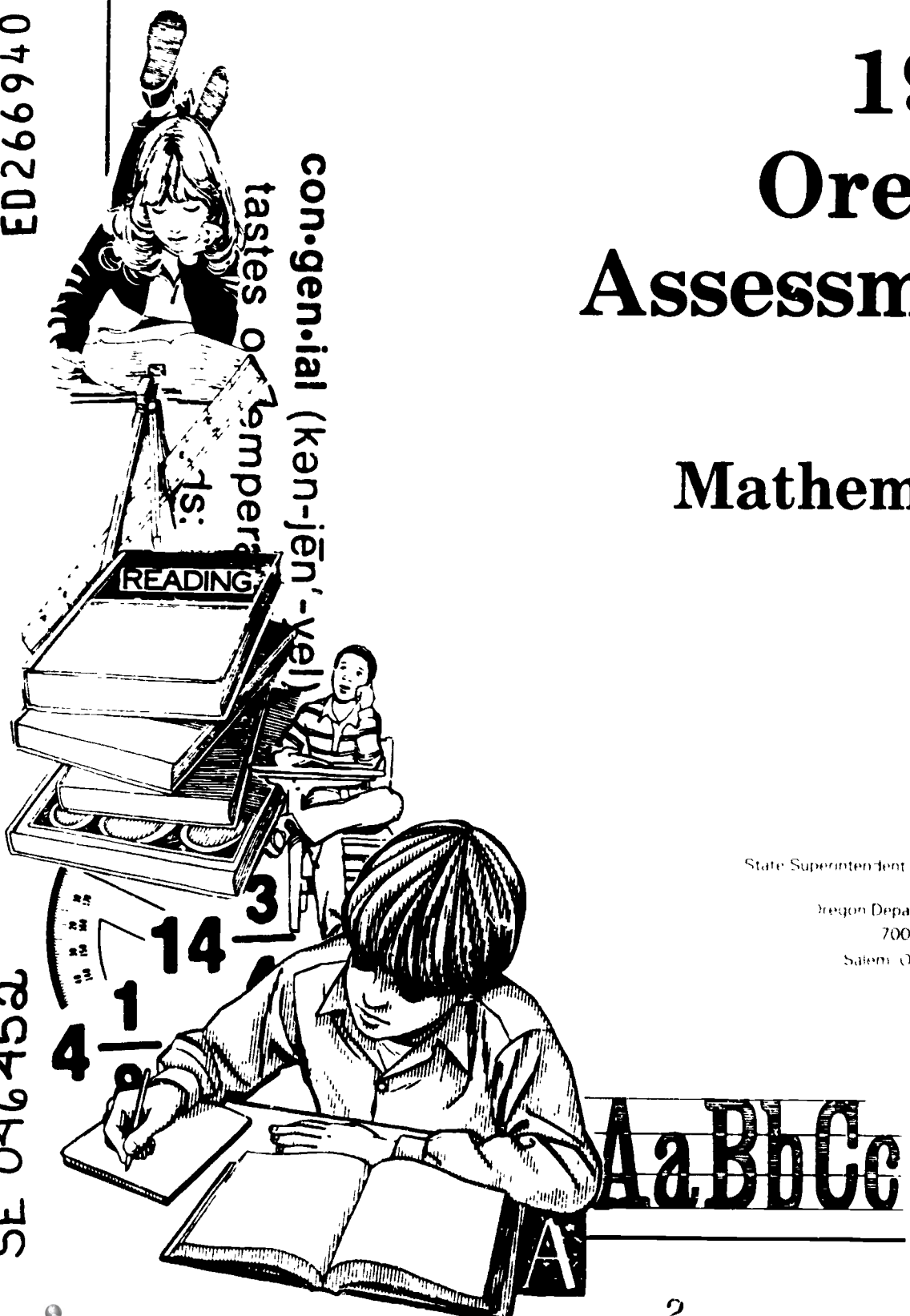
ABSTRACT

In the spring of 1985, the Oregon Department of Education conducted an assessment of eighth grade students' skills in writing, reading, and mathematics. This report provides results for the mathematics portion of the assessment under these headings: (1) arithmetic skills; (2) estimation; (3) geometry and measurement; (4) application; (5) problem-solving; (6) percent, ratio, proportion, and probability; (7) score differences based on gender; and (8) use of a calculator. In addition, information on test development, test design, test administration, and on scoring and reporting is provided. Also included are highlights of findings and recommendations. Among the findings are those showing that the general level of mathematics achievement among Oregon eighth graders is greater than 60 percent of students nationally, that student performance in arithmetic skills was at an excellent level (with the exception of basic operations involving fractions), and that student performance in estimation and probability was lower than desired (with more emphasis recommended, including inservice programs to upgrade teaching skills related to both of these skill areas). One of the recommendations offered is to train and use mathematics resource teachers and to implement peer coaching strategies to assist teachers in the instruction of low performance areas. Appended are a statewide summary report and a sample school summary report.(JN)



1985 Oregon Assessment

Mathematics

Grade 8

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Oregon Department of Education
700 Pringle Parkway SE
Salem, Oregon 97310-0290

OREGON STATEWIDE ASSESSMENT

1985

MATHEMATICS

OREGON DEPARTMENT OF EDUCATION

OCTOBER 1985

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ACKNOWLEDGEMENTS

The conduct of Oregon's Statewide Assessment could not have been accomplished without the cooperation and dedication of many individuals. Foremost, were the students, teachers and administrators who were involved in the administration of the tests. Several committees also played important roles in the assessment, including a content panel to help us determine the content and items to be used on the test, a testing advisory committee to help determine the procedures, and an interpretive panel to help analyze and interpret the results. The members of these committees are listed at the end of the report. In addition, within the Department of Education the following individuals were extremely valuable in conducting the assessment in a professional and thorough manner: Thelda Bevens, Language Arts Specialist, Don Fineran, Mathematics Specialist, Ninette Florence, Reading Specialist, Steve Slater, Evaluation Specialist, Gale Roid, Assessment Specialist, and Susi Ayers, Assessment Secretary.

There were also a number of agencies and contractors who provided assistance to the project. In particular, National Computer Systems provided the support for printing and distributing materials, as well as scoring and reporting the results. Washington County Education Service District conducted the scoring of the papers included in the writing assessment, Vicki Spandel supervised the scoring of the writing papers and she and Don Blanchard, from the scoring team, conducted workshops throughout the state on the scoring method, Susan Smoyer helped prepare the final reports, and Michael Hiscox and Evelyn Brzezinski, from Interwest Applied Research, provided support for the construction of the tests.

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OREGON STATEWIDE ASSESSMENT 1985
MATHEMATICS

Introduction

In the spring of 1985, the Oregon Department of Education conducted an assessment of eighth graders' skills in writing, reading and mathematics. This assessment was designed to serve the following purposes:

- Provide information to parents, students, and teachers regarding strengths and weaknesses in writing, reading and mathematics.
- Give direction to the improvement of curriculum and instruction in participating schools and the state as a whole.
- Provide an overall indication of how well Oregon students are achieving in reading and mathematics, relative to national norms.
- Determine the feasibility of using locally-selected standardized tests to obtain statewide achievement data.

This report provides the results for the mathematics portion of the assessment. Similar reports are available for reading and writing.

Test Development

In order to meet the first three purposes, state tests were developed which provided a model for testing that matched state selected skills and knowledge. This was in anticipation of a state testing program designed around a set of common skills and knowledge identified for the state.

The test content specifications were determined by a panel of Oregon teachers and curriculum specialists and the Department of Education mathematics specialist. Potential test items were then selected from item banks of field tested items and from other assessment instruments. The content panel reviewed this pool of possible test items and recommended those to be used in the 1985 state mathematics test.

The Department of Education then field tested the test items with 150 eighth grade students from Boulder, Colorado in order to determine whether any items were poorly written or defective in other ways. Minor revisions were made, resulting in the final version of the test. Members of the Content Panel are listed in Appendix B.

Test Design

The state mathematics test was designed to measure student achievement in six skill areas commonly taught through the eighth grade. These skills were defined as follows:

1. Arithmetic Skills--solving addition, subtraction, multiplication, and division exercises with whole numbers, fractions, and decimals (12 items).
2. Estimation--determining approximate answers to mathematical problems through knowledge of place value, rounding numbers, and determining range of possible answers (7 items).

3. Geometry and Measurement--identifying geometric figures and applying concepts of perimeter, area, and volume, as well as measuring angles (6 items).

4. Applications--solving practical mathematical problems encountered in real life situations (9 items).

5. Problem Solving--applying logic and solution strategies (i.e., guess and check, constructing diagrams or tables, looking for patterns, or selecting the correct arithmetic operation) in determining the solutions to mathematical problems (7 items).

6. Percent, Ratio, Proportion, and Probability--using the concepts of percent, ratio, proportion, and probability in solving mathematical problems (8 items).

The test was divided into two parts: Part I contained 26 items covering arithmetic skills, geometry, measurement and probability; Part II contained 23 items covering estimation, problem solving, applications and percents. Students were permitted to use a calculator on the second part of the test.

Test Administration

The mathematics test was administered during the weeks of April 15-April 26. The test consisted of two parts. Schools were given the option of administering the entire test in one day or administering the two parts on separate days.

The test was untimed in the strict sense. All students were allowed to finish within a reasonable amount of time. Estimates of the time needed by most students to complete the test were provided in the test administration guidelines. The estimates were based on the findings of pilot testing conducted by the Oregon Department of Education.

A total of 4,689 students in 55 schools composed the state sample in mathematics. These students made up a representative sample of eighth graders, chosen through a stratified random sample of schools.

Scoring and Reporting

The tests were scored by National Computer Systems. Assessment reports were returned to participating schools and districts in late May and early June, giving results at the student, classroom and building levels. District-level reports were provided if all eighth grade schools were involved. Guides were provided to help local educators understand and interpret the reports. The Statewide Summary Report and a sample School Summary Report are included in Appendix A.

Interpretive Panel

In June, the Department of Education convened a panel of teachers and curriculum specialists to draw conclusions about strengths and weaknesses in student performance and identify statewide needs for program improvement. Members of the Interpretive Panel are listed in Appendix B. The remainder of this report documents the panel's findings and recommendations.

HIGHLIGHTS OF THE PANEL'S FINDINGS AND RECOMMENDATIONS

- The general level of mathematics achievement among Oregon eighth graders is greater than 60 percent of students nationally.

- Student performance in arithmetic skills was at an excellent level, with the exception of basic operations involving fractions. Additional emphasis is needed on the instruction and testing of commonly used fractions, with particular attention to concept development rather than additional drill and practice.

- Considerable emphasis is needed in the area of geometry and measurement concepts beginning at the elementary school level. Inservice programs to upgrade teaching skills are strongly recommended.

- Recent emphasis on problem solving and math applications has had a positive impact on student performance in these areas. However, performance on applications using percents and fractions were lower than desired and additional emphasis is recommended.

- Student performance in estimation and probability was lower than desired and more emphasis is recommended, including inservice programs to upgrade teaching skills related to both of these skill areas.

- For all low performance areas requiring additional emphasis, the panel recommended that (1) emphasis should be placed on testing as well as instruction, and (2) instruction of these skills should be integrated throughout the mathematics curriculum.

- Additional emphasis requires more time and/or a different method of instruction. Less time should be spent on drill and practice activities, especially activities that require complex calculations with fractions and decimals and the multiplication and division of large whole numbers.

- Additional recommendations to upgrade areas of low performance included:

  - Additional emphasis on low performance areas in the curriculum guides currently being prepared by the Oregon Department of Education;

  - A commitment from all educational agencies and organizations to focus staff development activities on low performance areas in order to increase teacher preparedness;

  - Attention to low performance areas in the consideration of new criteria for textbook adoption that occur in the state;

  - Examination of standardized tests with respect to their coverage of low performance areas to determine how well they are aligned with Oregon's recommended mathematics curriculum;

- Attention to low performance areas on tests developed for use in the mathematics contests that occur in the state;

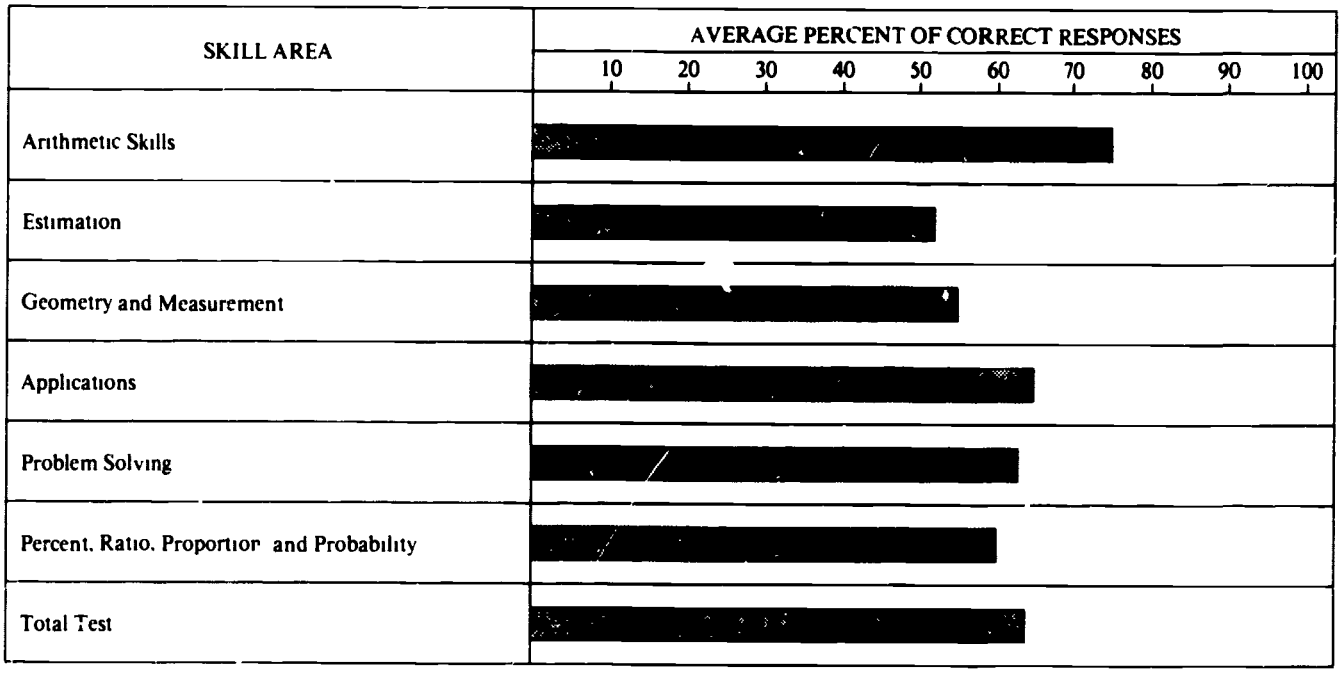
- Training and use of mathematics resource teachers and implementation of peer coaching strategies in schools to assist teachers in the instruction of low performance areas.

- The high percentage of students using a calculator on Part II of the test is an indication of the growing use of calculators in instruction and testing. This trend should be encouraged.

RESULTS AND INTERPRETATION

The general level of mathematics achievement among Oregon eighth graders places them at a level above approximately 60 percent of eighth graders nationally.[1] Figure 1 below displays the results for the test as a whole and for each skill area.

Figure 1. Mathematics — Student Performance on Total Test and Major Skill Areas



The panel rated student performance in arithmetic skills involving whole numbers and decimals to be at an excellent level. Performance in basic operations involving fractions, however, was lower than desired. Problem solving and application skills were thought to be at a satisfactory level. Areas of performance judged to be lower than desired included geometry and measurement, estimation, probability, and applications of fractions and percents.

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[1]Equating of the average total score to a series of normed publishers' tests gave a range of percentile ranks from 56 to 68. The more recent norms gave a score closer to the 60th percentile.

The sections that follow should serve to help explain and interpret the results for each skill area. Figure 2 displays the percentage of correct responses for each item on the test. In this figure, items are grouped by skill area.

Arithmetic Skills

In general, the interpretive panel was very satisfied with the overall level of student achievement in this skill area (75.8 percent). Scores for items dealing with the addition, subtraction, multiplication and division of whole numbers and decimals ranged from 74.0 percent to 87.8 percent. Student performance on basic operations involving commonly used fractions, however, was lower than desired. The panel noted that the only items in the arithmetic skills part of the test with scores below 70 percent involved computations with fractions. These items appear below:

Item No.		Percent Correct
4	2 3/4 + 3 1/3	69.7%

(A) 5 4/7
(B) 5 3/12
(C) 6 1/12
(D) 6 4/12
(E) 5 1/12

Item No.		Percent Correct
6	1/2 of 1/4 is	64.8%

(A) 1/2
(B) 1/4
(C) 1/6
(D) 1/8
(E) none of these

Item No.		Percent Correct
27	How many eighths of an inch are in 4 1/8 inches?	57.1%

(A) 5
(B) 9
(C) 32
(D) 33
(E) 41

Items #6 and #27 were judged by the panel to be more difficult items because the arithmetic operations needed to solve the problems were presented verbally in word-problem format. However, both, were considered to be good items.

Figure 2

STUDENT PERFORMANCE ON INDIVIDUAL ITEMS
ON THE STATE MATHEMATICS TEST

Skill Area	Item Nos.	Percent Correct	Percent Mults/Omits
Arithmetic Skills			
	1	83.8	0.1
	2	84.3	0.1
	3	84.0	0.2
	4	69.7	0.5
	5	73.6	0.6
	6	64.8	0.4
	7	87.8	0.2
	8	72.2	0.3
	9	82.3	0.8
	10	74.0	0.5
	13	75.4	0.5
	27	57.1	1.1
Estimation			
	11	45.5	1.1
	14	68.9	0.5
	34	72.1	0.5
	40	50.3	1.0
	41	47.9	1.2
	47	48.6	2.6
	48	31.5	3.0
Geometry and Measurement			
	23	41.0	1.1
	24	53.1	0.9
	26	85.5	0.8
	28	38.3	0.2
	29*		
	43	68.8	1.3
	44	35.0	1.2
Applications			
	25	85.2	0.9
	31	64.9	0.5
	32	69.1	0.4
	35	32.2	0.5
	36	80.4	0.5
	38	58.5	0.5
	46	40.0	2.1
	49	69.3	3.0
	50	76.5	3.1
Problem Solving			
	12	75.7	0.5
	20	77.9	0.6
	21	59.4	0.8
	22	70.7	1.2
	33	58.3	0.5
	39	61.2	1.0
	45	26.2	1.5
Percent, Ratio, Proportion and Probability	15	84.7	0.4
	16	64.6	0.4
	17	59.7	0.5
	18	69.4	0.7
	19	65.5	0.5
	30	58.5	0.5
	37	34.3	0.9
	42	46.4	1.2
Used Calculator?	51	YES = 56.7% NO = 43.3%	

*This item was not scored due to measurement inconsistencies.

The panel recommended that additional emphasis should be placed on the teaching of commonly used fractions, with particular attention to concept development (using models and manipulatives) rather than additional drill and practice. In addition, maintenance of skills related to fractions should be integrated throughout the mathematics curriculum wherever fractions naturally arise (e.g., problem solving, measurement, probability).

No additional emphasis was recommended for basic operations involving whole numbers and decimals.

Estimation

Student performance in this skill area (51.4 percent) was lower than desired. With the exception of one item, all scores were below 70 percent. Three items were similar in format, and the panel thought that students having difficulty with one would most likely have difficulty with all three. An example follows:

Item No.		Percent Correct
41	4,00? X 9,989	47.9%

(A) 2,451,872
(B) 3,958,967
(C) 36,005,672
(D) 40,045,901
(E) 53,005,872

Upon further investigation, the panel noted that the most frequently chosen incorrect answer (36,005,672) seemed to indicate that students were using the concept of estimation, but not using it correctly. The panel recommended that the instruction of estimation should include helping students get a feel for the reasonableness of computed results and distinguish between estimation and mental computation.

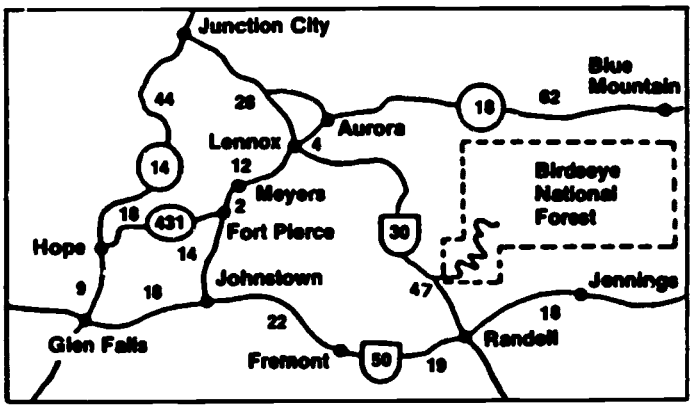
The lowest scores in this skill area were on two items which required problem solving skills as well as estimation. These items appear below:

Item No.		Percent Correct
47	Two hikers were climbing Mt. Hood. At noon their thermometer showed it was 35 degrees. They radioed back and learned it was 47 degrees at the lodge. They know that the temperature drops about 5.5 degrees for every thousand feet they climb.	40.0%

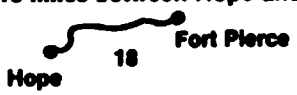
About how far above the lodge had they climbed by noon?

(A) 1,200 feet
(B) 2,000 feet
(C) 3,000 feet
(D) 4,000 feet
(E) 5,500 feet

Item No.	Percent Correct
48	31.5%



The numbers indicate the distance between cities.
(Example: It is 18 miles between Hope and Fort Pierce.)



About how long would it take to fly straight from Jennings to Blue Mountain in a plane that averages 120 miles per hour?

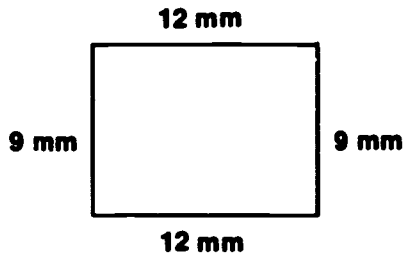
(A) less than half an hour
(B) about 1 hour, 10 minutes
(C) about 1 hour, 55 minutes
(D) about 2 hours, 30 minutes
(E) There is no way to estimate how long it would take.

Item #48 was considered by the panel to be a particularly difficult item because it required several steps to solve the problem. The most frequently chosen incorrect answer indicates that many students thought there was no way to estimate the answer. The panel conjectured that the low scores for both items #47 and #48 may have been due, in part, to placement of these rather complex problems near the end of the test. (However, the percent of omits were only 2.6 per- cent and 3.1 percent respectively.)

In addition to recommending that more emphasis be placed on the teaching of estimation as a concept, the panel felt that estimation should be stressed in testing as well. The panel also agreed that the teaching of estimation should be integrated throughout the mathematics curriculum.

Geometry and Measurement

The panel concluded that performance in this skill area clearly indicates a need for more emphasis in both the teaching and testing of geometry and measurement skills. The average score was 53.3 percent. This was considerably lower than the panel desired. Of particular concern was the low score on one item dealing with the area of a rectangle. This item is shown below:

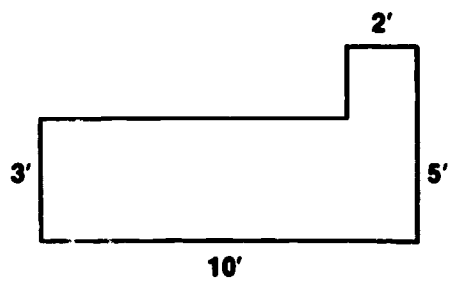
Item No.		Percent Correct
28		38.3%

Find the area of the rectangle shown above.

(A) 21 sq mm
(B) 42 sq mm
(C) 108 sq mm
(D) 144 sq mm
(E) none of these

This type of item may have been unfamiliar to many students because it presented more information than is typically presented in textbook exercises on area (only one length and width are usually given). Many students simply added all numbers presented in the picture to arrive at the area. The panel concluded that performance on this item indicates that more concept instruction on area is needed rather than additional drill and practice.

The item below displays an item in which needed information had to be derived by the student. To solve the problem, students were required to calculate the lengths of each segment in order to find perimeter. Most students simply added only those numbers that were provided rather than correctly applying the concept of perimeter.

Item No.		Percent Correct
44		35.0%

How much fencing would be needed to enclose this garden plot?

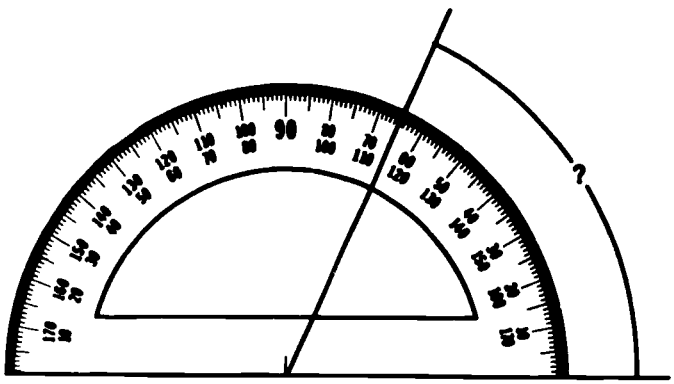
(A) 20 feet
(B) 30 feet
(C) 40 feet
(D) 50 feet
(E) 60 feet

16

The low scores on the two previous items led the panel to conclude that teachers should include more problems of both types (containing extra or missing information) in instruction and testing.

The panel was very satisfied with student performance on the item dealing with angles. This item appears below:

Item No.	Percent Correct
26	85.5%

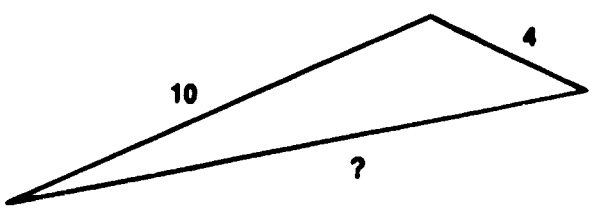


How large is the angle?

(A) 45°
(B) 60°
(C) 65°
(D) 115°
(E) 120°

Students, however, had considerable difficulty with two items involving triangles. These items appear below:

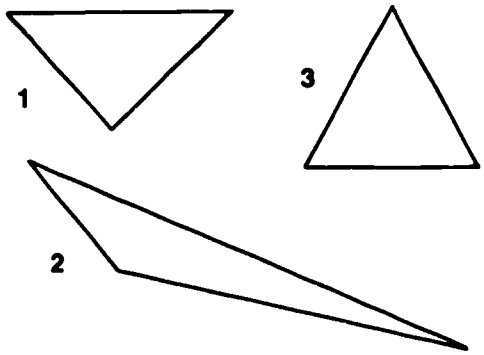
Item No.	Percent Correct
23	41.0%



Which of these could be the length of the third side?

(A) 6
(B) 13
(C) 14
(D) 16
(E) all of these

Item No.	Percent Correct
24	51.3%



Which is a triangle?

(A) only 1
(B) only 3
(C) only 1 and 3
(D) only 2 and 3
(E) all of them

The panel felt that these scores indicate that instruction involving shapes in addition to the square, circle, and rectangle needs to be introduced in earlier grades. Examples of nonstandard orientations of geometric figures should be included more frequently in instruction and testing. In item #24,

Triangles #1 and #2 both have nonstandard orientations, whereas triangle #3 has a standard orientation. Some students may have had difficulty with this item because of their lack of exposure to nonstandard orientations of geometric figures. Instruction on triangles should also include more examples of triangles that are scalene (triangles with unequal sides).

In addition, students should be encouraged to find geometric concepts in their environment and to think about why specific geometric objects are commonly used for certain purposes (e.g., triangular braces in construction). Learning names and geometric terminology should only be a starting point of instruction rather than a major focus.

The panel concluded that geometry and measurement skills should be taught and tested every year in grades K through 8. Instruction should be developmental in nature, presenting a fundamental set of geometry and measurement skills and concepts. Further, instruction should occur throughout the year and be integrated throughout the mathematics curriculum especially in the areas of applications and problem solving. The panel also strongly recommended that instruction include a greater use of manipulatives, models and measuring devices in this skill area. An additional observation was that moving directly from the concrete to the abstract may be too big a step for many students. A transitional step using pictures, diagrams and sketches may be needed.

The panel discussed the possibility that some teachers may have difficulty teaching geometry and measurement skills and concepts effectively at the elementary school level. Efforts may be needed to provide a strong inservice program in this area. Strategies for hiring teachers with these skills at the elementary level should also be considered.

Application

In general, the panel was satisfied with student performance in this skill area (64.4 percent). Panel members felt that the emphasis on applications over the past ten years in Oregon has had a positive impact on student performance and recommended continued emphasis.

Scores involving chart reading were particularly good. The panel was disappointed, however, with student performance in computing an average. This item appears below:

Item No.		Percent Correct
31		64.9%

Joanna	52
Bill	49
Cindy	51
Alice	55
Yukling	58

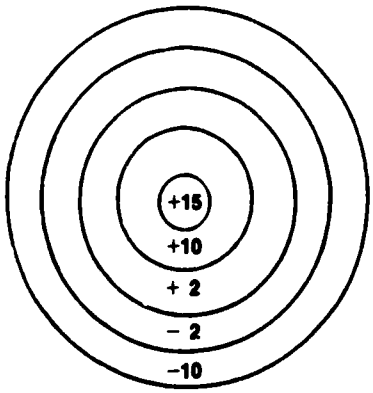
Find the average score of the math tests.

(A) 50
(B) 51
(C) 52
(D) 53
(E) none of these

Two other items of concern to the panel involved the addition of positive and negative numbers:

Item No.		Percent Correct
35	Death Valley is 282 feet below sea level and Mt. Hood is 11,245 above sea level. How much higher than Death Valley is Mt. Hood?	32.2%

(A) 10,963 feet
(B) 11,063 feet
(C) 11,245 feet
(D) 11,427 feet
(E) 11,527 feet

Item No.		Percent Correct
38	 Jake played a dart game. He scored the number of points in the area where the dart landed. Jake tossed four darts. Two of the darts were in an area marked +15 points, 1 dart was in an area marked –10 points, and 1 dart was in an area marked –2 points. What was Jake's score for the game? (A) 3 (B) 18 (C) 27 (D) 42 (E) none of these	58.5%

The low percent correct on item #46 below supported the panel's recommendation that more concept instruction in fractions is needed. The complexity of the problem and its placement near the end of the test may have also added to the difficulty students had with this item.

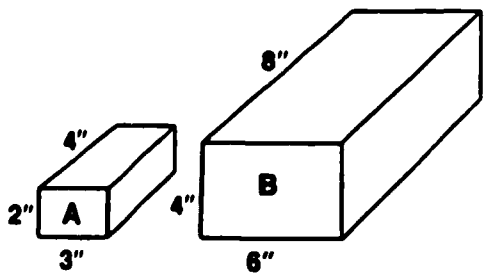
Item No.		Percent Correct
46	Ann's father plans to make a set of shelves. Three of the shelves are to be 2 1/2 feet long. Two of the shelves are each to be 3 3/4 feet long. He buys a 16 foot board to make the shelves. Which of the following is true? (A) The board is exactly long enough. (B) The board is 2 feet too short. (C) The board is 1 foot too short. (D) About 1 foot of board will be left over. (E) none of these	40.0%

Problem Solving

The panel judged student performance in this skill area to be at an acceptable level (61.4 percent). The recent emphasis on problem solving in Oregon schools has improved student performance, but the panel cautioned that despite the gains, emphasis should continue in this skill area.

Panel members were very disappointed with student performance on the only item on the test dealing with volume. This item appears below:

Item No.	Percent Correct
45	26.2%



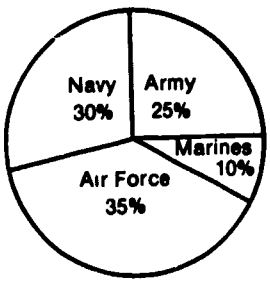
How much more volume is there in box B?

(A) 2 times as much as A
(B) 4 times as much as A
(C) 6 times as much as A
(D) 8 times as much as A
(E) same as A

The most frequently chosen answer (2 times as much as A) indicates that more concept instruction on volume is needed through use of manipulatives and models. Students should be led to discovering how changing the dimensions of two-dimensional and three-dimensional geometric objects affects area and volume. For example, if both dimensions of a rectangle are doubled, the area increases by a factor of 4; if all dimensions of a box are doubled, the volume increases by a factor of 8 while the surface area increases by a factor of 4.

Percent, Ratio, Proportion and Probability

Student performance in this skill area averaged only 60 percent correct. Of particular concern to the panel were the scores on items dealing with percent applications:

Item No.		Percent Correct
30	 Three hundred men volunteered. How many are marines? (A) 10 (B) 25 (C) 35 (D) 20 (E) 30	58.5%

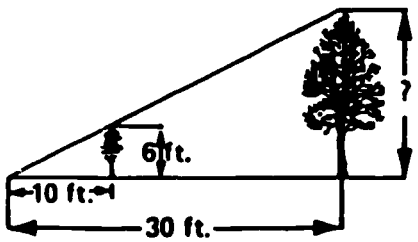
Item No.		Percent Correct
37	The price of blank tape cassettes is normally $2.99 each. During the end-of-winter sale, cassettes sell for 30 percent off. Which of these choices is closest to the sale price of the cassettes? (A) $1.69 (B) $1.99 (C) $2.10 (D) $2.39 (E) $2.69	34.3%

The low percent correct on these items led the panel to conclude that more emphasis should be given to the instruction and testing of percent applications. Emphasis should involve more time as well as an effort to give more meaning to computations through the use of models.

Considering the amount of instruction students typically receive in probability, the panel was not surprised by the low scores on these items (range 59.7 percent - 69.4 percent). However, panel members felt that the scores reflect the lack of instruction in this area, and they recommended additional emphasis. Probability should be introduced at the beginning of the year and integrated throughout the year rather than teaching it as the last chapter in the eighth grade text. Since probability is one area that many students consider to be fun, the panel felt that some informal instruction in probability should be introduced at the elementary school level. Some teachers may need an inservice program to help them develop their instructional skills in this area, especially to help them capitalize on existing student interest.

The panel was disappointed with student performance related to proportion. This item appears below:

Item No.	Percent Correct
42	46.6%



The picture shows how Jose used a short tree to find the height of the tall tree. What answer did Jose get?

(A) 12 feet
(B) 15 feet
(C) 18 feet
(D) 20 feet
(E) 36 feet

However, panel members felt that this may be an area for further investigation as they were not sure if the geometry concept presented in this item is included in the eighth grade mathematics curriculum.

Score Differences Based on Gender

A preliminary look at score differences between girls and boys revealed the following findings:

- There were five items on the test on which girls scored significantly higher than boys.[2] All five items were in the arithmetic skills section of the test.
- Boys scored significantly higher on eight items ranging across all skill areas except arithmetic skills and problem solving.

The panel discussed some possible reasons for these results. Some research studies indicate that girls tend to develop skills in step-by-step, computational problem solving sooner than boys, and they are often rewarded for success with these skills beginning in the early grades. The concern expressed by the panel was that if the rewards are excessive, this may reinforce the idea that success means "getting the right answer." Girls may become fearful of experimenting with mathematical concepts and more open-ended types of problems because they are not assured of success. To foster girls' success in these areas, the panel recommended a greater emphasis on conceptual skill development and an increased use of manipulatives.

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[2] A conservative significance level was set at $p < .0002$ to correct for multiple tests across the 49 items in the large sample (N = 4,689) and to ensure that a meaningful effect was detected (e.g., phi greater than .06).

Use of a Calculator

Students were permitted to use a calculator on Part II of the test. The test development committee felt that calculators should be allowed in order to reinforce the idea that calculators are tools for problem solving. The items on the part of the test where calculators were permitted were selected so the emphasis in the items was on concepts rather than on computation. Consequently, if students could not reason out the approach to solving the problem, they would not have an advantage using calculators.

Over 56 percent of students indicated that they used calculators on this part of the test. The panel was particularly pleased with this figure and considered it to be an indication of the growing use of calculators in instruction and testing.

A preliminary look at the differences in student performance between calculator users and nonusers reveals a small but noticeable effect (effect size = .22 standard deviation units on Part II of the test). The mean score for calculator users was one point higher than the mean score for nonusers on items contained in Part II of the test. Results by both groups on Part I of the test (in which calculators were not permitted) were slightly in favor of the group that used calculators on Part II. However, this initial difference on Part I, when used as a control in studying differences on Part II, was not the primary reason for the small calculator effect on Part II. Thus, calculator users tended to be slightly more able students in mathematics, and their use of calculators resulted in only a very small advantage on Part II of the test. This finding is similar to that of Carpenter, Corbitt, Kepner, Lindquist & Reys (1981) who found no advantage for calculator use on the problem solving portions of the National Assessment of Educational Progress.[3]

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[3]Carpenter, T.P., Corbitt, M.K., Kepner, H.S., Lindquist, M.M., & Reys, R.E. (1981) Calculators in testing situations: Results and implications from National Assessment. Arithmetic Teacher 28, 34-37.

APPENDIX A

STATEWIDE SUMMARY REPORT

SAMPLE SCHOOL SUMMARY REPORT

OREGON STATEWIDE ASSESSMENT 1985

MATHEMATICS
GRADE 8

NUMBER OF STUDENTS TESTED: 4,689

STATE SUMMARY REPORT

‡ = School Average ▲ = State Average

SKILL AREA	AVERAGE PERCENT CORRECT (0 10 20 30 40 50 60 70 80 90 100)	Number of Items in Skill Area	Number of Items Answered Correctly: State Average
ARITHMETIC SKILLS	75.8 ‡ 75.8	12	9.1
ESTIMATION	51.4 ‡ 51.4	7	3.6
GEOMETRY AND MEASUREMENT	53.3 ‡ 53.3	6	3.2
APPLICATIONS	64.4 ‡ 64.4	9	5.8
PROBLEM SOLVING	61.4 ‡ 61.4	7	4.3
PERCENT, RATIO, PROPORTION AND PROBABILITY	60.0 ‡ 60.0	9	4.8
TOTAL TEST	62.7 ‡ 63.1	49	30.8

Content Ar	Percentage of Students in Each Quarter of the State Student Distribution: Below Q_1	Between Q_1 and Q_2	Between Q_2 and Q_3	Above Q_3	State Percentile
TOTAL MATHEMATICS					

tudents are deleted from these results due to 'non-attempt' or 'adapted' status

OREGON STATEWIDE ASSESSMENT 1985

MATHEMATICS
GRADE 8

NUMBER OF STUDENTS TESTED: 151

DISTRICT:

SCHOOL:

SCHOOL SUMMARY REPORT

‡ = School Average ▲ = State Average

SKILL AREA	AVERAGE PERCENT CORRECT (0 10 20 30 40 50 60 70 80 90 100)	Number of Items in Skill Area	Number of Items Answered Correctly: School Average	Number of Items Answered Correctly: State Average
ARITHMETIC SKILLS		12	9.7	9.1
ESTIMATION		7	4.2	3.6
GEOMETRY AND MEASUREMENT		6	3.5	3.2
APPLICATIONS		9	6.2	5.8
PROBLEM SOLVING		7	4.5	4.3
PERCENT, RATIO, PROPORTION AND PROBABILITY		8	5.1	4.8
TOTAL TEST		49	33.2	30.8

Content Area	Percentage of Students in Each Quarter of the State Student Distribution: Below Q_1	Between Q_1 and Q_2	Between Q_2 and Q_3	Above Q_3	Median State Percentile
TOTAL MATHEMATICS	14.6	24.5	26.5	34.4	58.7

25

28

29

dents are deleted from these results due to 'non-attempt' or 'adapted' status

SUMMARY REPORT FOR MATHEMATICS

ABOUT THE OREGON STATEWIDE ASSESSMENT PROGRAM

The primary purpose of the 1985 Oregon Statewide Assessment is to inform educators and policymakers about the status of eighth graders' achievement in the basic skills of reading, writing, and mathematics. The tests also provide useful information about student achievement to parents and are intended to assist teachers and administrators in planning curriculum and instruction. The tests were developed by content panels of Oregon teachers, curriculum specialists, and Department of Education subject area specialists. Unless your school made special arrangements, each student was tested in only one subject area (reading, writing, or mathematics).

HOW TO INTERPRET THE SCHOOL SUMMARY REPORT

Description of Skills Tested. The state mathematics test was designed to measure student achievement in six skill areas commonly taught through grade 8. These skill areas are defined as follows:

1. **Arithmetic Skills** — solving addition, subtraction, multiplication, and division problems with whole numbers, fractions, and decimals (12 items).
2. **Estimation** — determining approximate answers to mathematical problems through knowledge of place value, rounding numbers, and determining range of possible answers (7 items).
3. **Geometry and Measurement** — identifying geometric figures and applying concepts of perimeter, area, and volume, as well as measuring angles (7 items).
4. **Applications** — solving practical mathematical problems encountered in real life situations (9 items).
5. **Problem Solving** — applying logic and solution strategies (i.e., guess and check, constructing diagrams or tables, looking for patterns, or selecting the correct arithmetic operation) in determining the solutions to mathematical problems (7 items).
6. **Percent, Ratio, Proportion, and Probability** — using the concepts of percent, ratio, proportion, and probability in solving mathematical problems (8 items).

Information Presented in the School Summary Report. The results describing the performance of students in your school are displayed in several ways. For each skill area and for the total test, the average percentage of correct responses is indicated by the symbol, " ✱ ". The bar extending on either side of the school average represents the standard error of the mean. This indicates the range which can reasonably be expected to contain your school's "true" score.

Also shown in this portion of the report are the state average percent correct scores (represented by the symbol ▲). These averages reflect the performance of all 6,100 8th graders included in the state sample for mathematics.

In the two columns on the right, the average number of items answered correctly within a skill area is given for your school and for the state sample.

Finally, the bottom area of the report presents the distribution of your students' scores with respect to the state score distribution. The distribution of student scores in the state sample is divided into four equal groups by the state quartiles (Q_1, Q_2, Q_3). Each quartile marks off, respectively, the lowest quarter of scores, the next highest quarter, and so on. The percentage of your students scoring in each of these four groups is given for the total school score. The figure at the right shows your school's percentile rank with respect to the state sample.

APPENDIX B

OREGON STATEWIDE ASSESSMENT .985
COMMITTEE MEMBERS

MATHEMATICS

Interpretive Panel

George Brow, Springfield School District
Don Fineran, Oregon Department of Education
Sue Loube, Grants Pass School District
Keippie May, Redmond School District
Debra Schneider, Beaverton School District
Larry Sleeman, Philomath School District
Dennis Williams, Western Oregon State College

Test Content Panel

William Burger, Oregon State University
Don Fineran, Oregon Department of Education
Dale Hill, Central Linn School District
Cheryl Klampe, Stayton Elementary School District
Oscar Schaaf, University of Oregon
Debra Schneider, Beaverton School District
Larry Sleeman, Philomath School District
Marcia Swanson, Greater Albany School District

Technical Advisory Committee

Eric Bigler, Clackamas County ESD
John Erickson, Stayton School District
Bob Hammond, Springfield School District
Walt Hathaway, Portland School District
Dale Hess, Oregon Educational Coordinating Commission
Charlene Hurst, Salem School District
Bonnie Nalley, Douglas County ESD
Jean Pope, Jackson County ESD
Jens Robinson, McMinnville School District
Don Shutt, Pendleton School District
Peter Wolmut, Multnomah County ESD

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